- Require the independent entity to set up procedures for reviewing the qualifications of (and if necessary de-listing) approved testers based on the experience of broadcasters and satellite carriers with particular tests.

EchoStar invites the Commission to ignore the SHVIA and instead to endorse the following, grievously flawed procedure: allowing EchoStar's satellite dish installers -- who have an obvious bias to "tell their customers what they want" -- to conduct signal intensity tests on an *ex parte* basis, that is, with no advance notice to the affected stations. EchoStar Comments at 8-9. The potential for mischief when a biased person purports to conduct a secret signal intensity test is obvious and grave. Nor is this risk merely theoretical: broadcasters have received many "test reports" from EchoStar in which, among other things, a satellite installer has (a) performed grossly incorrect calculations as a way of declaring a household to be "unserved," and/or (b) achieved the same result by measuring only a far-away network station, while ignoring a nearby affiliate of the same network. Indeed, it is precisely to avoid such shenanigans that Congress required that signal intensity tests be conducted by "qualified and *independent*" persons and required that both stations and satellite carriers be able to participate in the testing process. 47 U.S.C. § 339(c)(4)(A).

In particular, under the SHVIA, a satellite carrier *must* presumptively determine a household's eligibility to receive distant network signals by obtaining a prediction from the Commission's ILLR model. 17 U.S.C. § 119(a)(2)(B)(ii)(I). The SHVIA also provides, in Section 119(a)(2)(B)(ii)(II), that the ILLR model's prediction about eligibility may be overridden *only* by an "accurate measurement" made pursuant to "section 339(c)(4) of the Communications Act." Section 339(c)(4) of the Communications Act, in turn, expressly provides for *joint* testing by stations and satellite carriers. 47 U.S.C. § 339(c)(4)(A). Accordingly, the Commission

should make absolutely clear that a satellite carrier may *never* offer service to an ILLR-predicted-ineligible customer based on an *ex parte* test, since the Act is absolutely clear that, to rely on a measurement to override an ILLR prediction, the measurement must be conducted by an "*independent*" person through a *joint* testing process.[9]

The AFCCE recommends that the Commission adopt an unfair system for paying the tester: that stations should have to pay the full cost of the test in advance, even though the statute provides for payment by the "loser" of the test. AFCCE Comments at 4; *compare* 47 U.S.C. § 339(c)(4)(B). The Commission lacks authority to alter the statute in this way. And even if it had the authority, it would be grossly unfair to stations to do so, because stations are likely to deny waivers (and to permit a test to go forward) only if it is clear that the test will show the household is served. That is, stations would be put in the position of paying, in advance, the full costs of tests that they will almost certainly "win."

The Commission is required to ensure that its testing regulations "avoid any undue burden on any party." 47 U.S.C. § 339(c)(4)(C). DirecTV makes one proposal in that regard: that tests conducted at nearby locations be deemed to apply to a households that asks for a new test. *If* the affected station(s) and the carrier agree to do so, this proposal would be proper -- and consistent with "avoid[ance] [of] undue burdens." However, the Commission should not permit either a station or a satellite carrier to unilaterally make such a determination.

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[9] Of course, *solely for its own information and without having any legal effect*, a satellite carrier could have installers conduct informal signal intensity tests at the time of installation. EchoStar Comments at 8-9. But that is entirely different from *offering service* to a household based on an *ex parte* test conducted by a biased party. The Commission should strictly forbid that practice.

To further implement its statutory obligation to avoid undue burdens, the Commission should issue regulations to insure against frivolous testing, *i.e.*, testing carried out in circumstances in which no reasonable person could believe that the household cannot receive a Grade B intensity signal with a conventional 30-foot (or 20-foot in appropriate cases) rooftop antenna. In particular, if a household is predicted by the ILLR model to receive a signal far above the Grade B minimum, the station and the carrier should be permitted to decline to conduct a test on the grounds that conducting a test would impose "undue burdens" on all parties with no corresponding benefit.

Conclusion

The Commission's existing ILLR model is remarkably accurate, as shown by its excellent fit with actual signal intensity measurements. The Commission should decline to alter its existing ILLR model in any of the ways currently proposed, since none of the proposed adjustments would increase the accuracy of the model.

Respectfully submitted,

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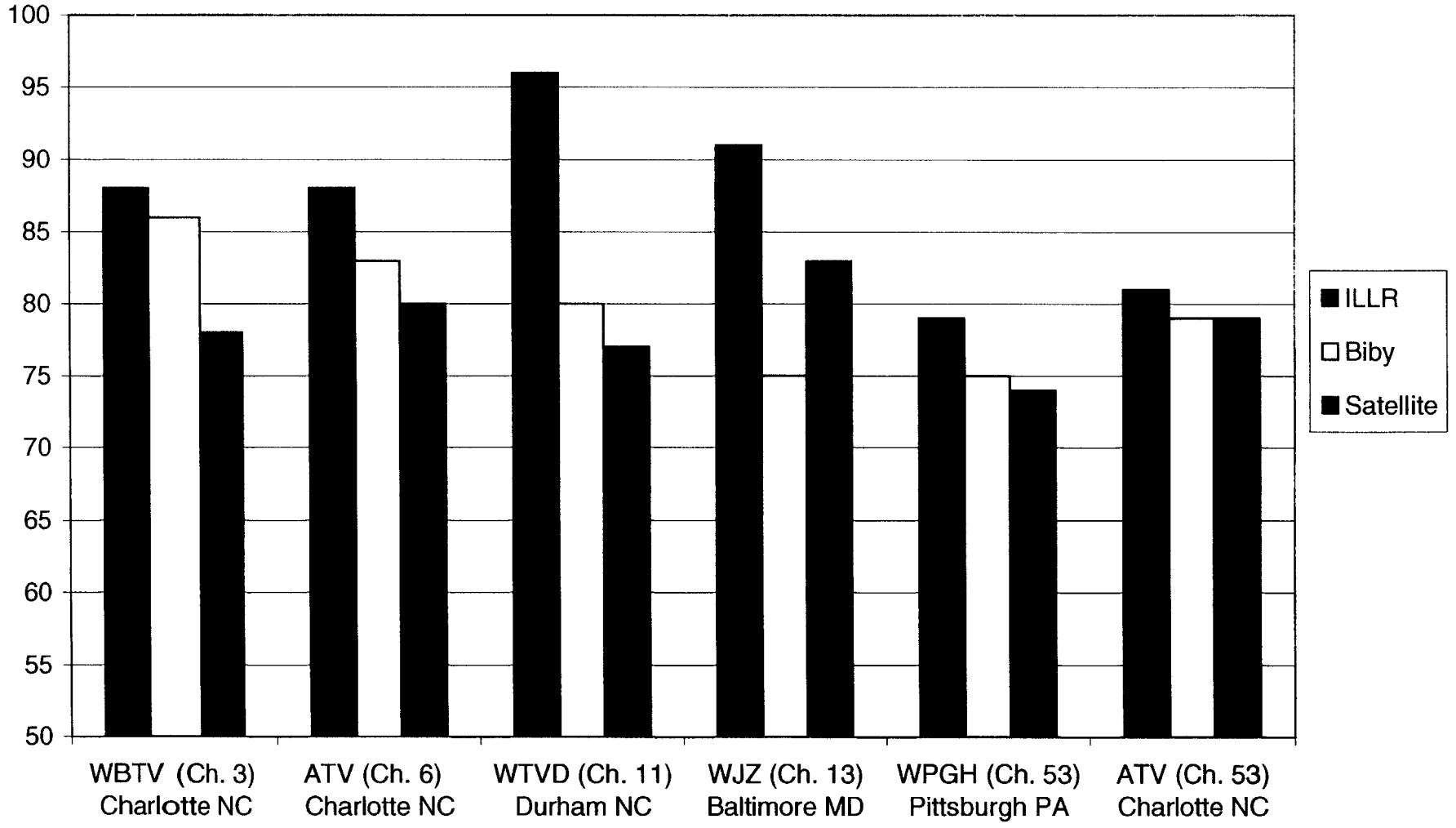
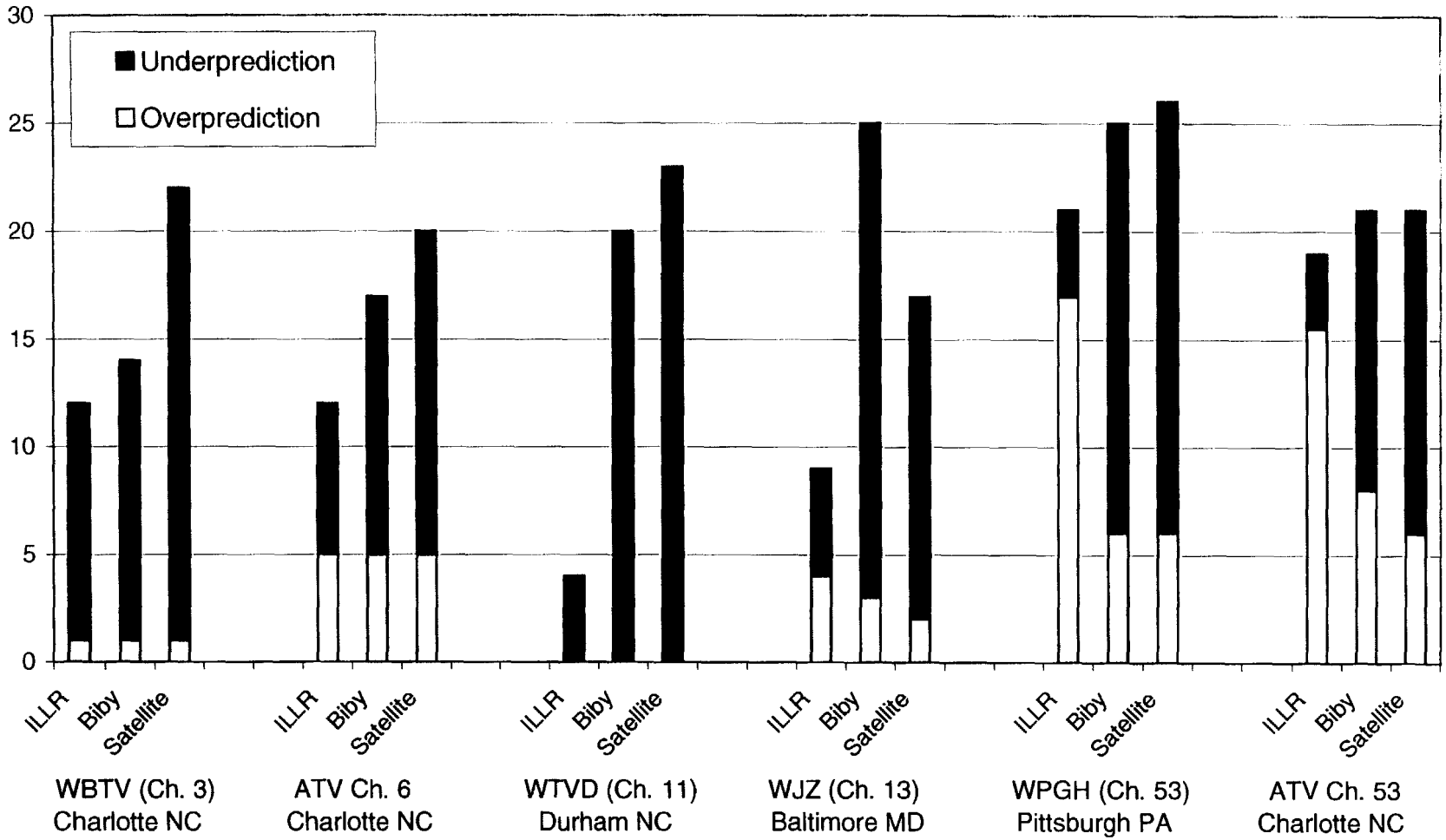
March 14, 2000

Percent of Correct Results
Existing ILLR Model vs. Modifications Proposed by Commenters



Percent of Incorrect Results
Existing ILLR Model vs. Modifications Proposed by Commenters



Jules Cohen, P.E.
Consulting Engineer

ORIGINAL

ENGINEERING STATEMENT
IN SUPPORT OF REPLY COMMENTS
ET DOCKET NO. 00-11

1. This engineering statement was prepared on behalf of the National Association of Broadcasters and the Association for Maximum Service Television, Inc. in support of reply comments in the matter of: *Establishment of an Improved Model for Predicting the Broadcast Television Field Strength Received at Individual Locations,* ET Docket No. 00-11.

Comments Proposing the Use of Particular Clutter Factors Fail to Satisfy the Basic Test

2. Comments suggesting the use of clutter loss factors as proposed by the Commission in the subject docket (DirecTV, Inc., Communications Technologies, Inc., and National Rural Telecommunications Cooperative) or use of modified clutter loss factors (Radiosoft, EchoStar Satellite Corporation and Richard L. Biby, P.E.) fail to satisfy the basic test of determining by actual field strength measurements whether their proposals would improve the prediction results. A database of measurements at a statistically valid selection of more than one thousand locations is available for checking the suitability of any proposed adjustment to the ILLR model. As demonstrated herein, none of the proposals so far submitted to improve the predictability of the eligibility of a particular location to receive distant network signals is an improvement over use of ILLR without the addition of a clutter factor.

The Measurement Database

3. Field strength measurements made in conformance with 47 C.F.R.§73.686 are available from the record of *CBS, Inc., et al. v. PrimeTime 24 Joint Venture* and in the *Field Test*

Results of the Grand Alliance HDTV Transmission Subsystem. The over 600 locations used for field strength measurements made in the former group were selected on the advice of a statistician. Subscriber lists from PrimeTime 24 were arranged alphabetically, the first location was made by a random selection, then additional locations were specified at fixed spacings to achieve the goal of designating at least 100 locations for each of the five communities. In one of the communities, the signals of two stations were measured, thus providing an additional 100 measurements. The communities, Miami, Baltimore, Pittsburgh, Charlotte and Raleigh/Durham provided a range from flat terrain (Miami) to very hilly terrain (Pittsburgh) with the other communities reasonably representative of a vast number of United States cities. Measurements were made on the road as close to the subscriber address as feasible. This meant that, at most locations, the 100-foot run over which measurements were made was centered on the entrance to the property.

4. The 398 measurements associated with the Grand Alliance HDTV test were also selected for statistical reliability. As described in my Engineering Statement of February 21, 2000, in support of Comments in the subject docket, three categories of measurement locations were employed: radials, grids and clusters. The eight radials were not evenly spaced around the transmitter but were selected to provide a variety of terrain conditions. A majority of the radials traversed rolling hills. The two grids were, respectively, in Charlotte, North Carolina, and Rock Hill, South Carolina, with the objective of measuring in one rather large city and in a medium sized city. Two of the three clusters were within the same communities as the grids, but with tighter spacings.

The third cluster, with only five measurements on each frequency, was intended to check the performance of the antennas for direct transmission rays at relatively large depression angles below horizontal. Radial measurements were made as close to the specified three-mile intervals as feasible. Grid and cluster measurements were made as close to the grid and cluster, regularly spaced intersections as feasible. No attempt was made to select locations with any special characteristics other than the ability to make the desired 100-foot runs without interference to the antenna erected to a height of 30 feet (9.1 meters) above street level. Measurements were made on NTSC transmissions on channels 6 and 53.

Specific Comments

5. Radiosoft proposes that low band clutter loss should be specified as 13 dB rather than 10 dB. The additional 3 dB is to compensate for multipath effects, but no justification is provided for the specific proposal, nor is any consideration given to the extreme variability of multipath effects.

6. The Association of Federal Communications Consulting Engineers (AFCCE) proposes that an analysis of measurements made as part of the work of the Television Allocations Study Organization (TASO) in the period from approximately 1956 to 1961 might suggest ways to improve the ILLR predictions. No note is taken of the large database of television station measurements mentioned previously herein although at least some AFCCE members are aware of the measurements made as part of the PrimeTime 24 proceeding and all should be aware of the

measurements made as part of the ATV tests.

7. EchoStar Satellite Corporation urges the Commission to modify its model to include additional losses over ILLR predictions due to building height and spacing in urban areas, additional losses for failure to achieve Fresnel zone clearance over portions of the transmitter-to-receiver path, losses due to multipath (ghosting), and other (unspecified) propagation anomalies. EchoStar claims to be undertaking measurements in locations without Fresnel zone clearance on the transmission path and has commissioned a study designed to relate the effect of multipath to LULC categories. The effect, or lack of effect, of the absence of Fresnel zone clearance is so dependent on the particular path that no measurement program could provide sufficient information to permit incorporation of that effect in a prediction program. (See also my comments relative to the DirecTV proposal.)

8. With regard to picture quality problems (ghosting) that may be caused by multipath, I understand that the present proceeding is limited to the prediction of signal strength, which is the test for eligibility to receive distant signals under the Copyright Act. Since ghosting is not a problem of signal strength, I understand that the present proceeding is not concerned with ghosting. In addition, ghosting usually can be minimized by use of a properly oriented directional antenna. In any event, although studies have been made of the subjective reaction to echoes of variable magnitude and delay[1], the likelihood is slim to nonexistent that a useful computer program could

[1] See Jules Cohen; Impairment of Television Picture Quality by Echoes (Ghosting), Appendix C to the Panel 2 report in the *Cable Television Technical Advisory Committee Report to the Federal Communications Commission*; May 1975; NTIS PB-247 808.

be written to predict the number, magnitude and respective delays of multipath signals at specific locations because of the extremely large number of variables that can affect multipath. For that reason, even adjacent residences can have widely different multipath effects.

9. DirecTV proposes that the ILLR model be modified to include losses due to inadequate Fresnel zone clearance. That modification with any reasonable expectation of accuracy for a given transmission path is not feasible. The magnitude of attenuation caused by the presence of obstacles within one Fresnel zone surrounding the direct transmission ray is determined by the reflection coefficient at the point of reflection. Except for over water paths, and even those are affected strongly by wave motion, the reflection coefficient is likely to be low, resulting in negligible loss. Furthermore, the reflected signal is often cut off by terrain features. No database exists, or is likely to ever exist, that would provide the detailed information about the nature of the soil (or man made features) permitting the derivation of the reflection coefficient at all required locations on the transmission path. In any event, Fresnel zone clearance losses are very much secondary as compared to the diffraction losses over obstacles that intercept the transmission ray.

10. Richard L. Biby, P.E. recommends the use of the Anita Longley urban factor equation with adjustments. He recommends also the use of noise factors as set forth by Skomal and multipath adjustments without saying how this should be done. Mr. Biby's recommendations do not meet the test of comparison with field strength measurements. Of particular interest is the fact that in Pittsburgh, where the ILLR model without clutter loss subtraction, compared to measurements, is

least accurate (although still quite good) Anita Longley in the Summary and Conclusions section of the paper cited by Biby states, on the basis of observations made in Pittsburgh: "This would suggest that the urban factor is also a function of terrain irregularity and decreases as the terrain becomes more irregular." Like EchoStar, Mr. Biby suggests that multipath should be a consideration in determining eligibility for the reception of distant network signals. Again, I understand that the current proceeding relates solely to predictions of signal intensity, and thus that the issue of ghosting due to multipath is irrelevant to this proceeding. In any event, Mr. Biby does not indicate how the possible presence of multipath could be integrated into a prediction program, and for the reasons discussed above, I see no realistic likelihood that such a program could be created.

11. The Joint Comments of the ABC, CBS, Fox and NBC Television Network Affiliate Associations correctly urge the Commission to follow the practice adopted in the DTV implementation of Longley-Rice (and in the February, 1999 SHVA Report and Order's description of ILLR) and treat all flagged points as served. The existence of an error code does not mean, necessarily, that the prediction is wrong, and much less that the household receives a signal of less than Grade B intensity. Depending on the code, it may indicate to the operator that the input to the program should be reviewed for accuracy because some factor may be outside of reasonable limits set by the program. Automatic characterization of a location as eligible for distant service if ILLR turns up an error code of 2, 3 or 4 is not justified. On the contrary, the ILLR prediction of service should be accepted whether or not error codes are indicated. A presumption that a household is

unserved based on an error code would have no basis in the operation of Longley-Rice, and would be inconsistent with the vast amount of measurement data showing that the great majority of households tested do in fact receive Grade B or better signals.

12. To test the impact of three proposed modifications to the Commission's current ILLR model, an analysis has been performed of the impact of those modifications on the model's accuracy in predicting by actual field strength measurements whether or not Grade B intensity is available at the more than 1,000 neutrally selected locations discussed above. The three modifications are:

a. the NPRM proposal to subtract simplified clutter loss estimates derived from Rubinstein, but only in locations with Fresnel zone clearance;

b. the satellite industry proposal to follow the NPRM approach, but in all locations, not just those with Fresnel zone clearance;

c. the proposal by Richard Biby to subtract a modified version of the "urban factor" proposed by Anita Longley.

13. As the following table shows, none of these models improves the accuracy of the existing ILLR model, and the latter two do the opposite: they greatly increase the number of incorrect predictions.

Jules Cohen, P.E.

March 14, 2000

Comparison of Effect of Clutter Modifications on Accuracy of ILLR Model

	Correct Prediction		*Over-Prediction*		*Under-Prediction*	
	(number of locations)	(percent of locations)	(number of locations)	(percent of locations)	(number of locations)	(percent of locations)
WBTV, Charlotte Channel 3						
ILLR	89	88%	1	1%	11	11%
NPRM	89	88%	1	1%	11	11%
Satellite	79	78%	1	1%	21	21%
Biby	87	86%	1	1%	13	13%
WFOR, Miami Channel 4						
ILLR	100	100%	0	0%	0	0%
NPRM	100	100%	0	0%	0	0%
Satellite	100	100%	0	0%	0	0%
Biby	100	100%	0	0%	0	0%
WSVN, Miami Channel 7						
ILLR	100	100%	0	0%	0	0%
NPRM	100	100%	0	0%	0	0%
Satellite	100	100%	0	0%	0	0%
Biby	100	100%	0	0%	0	0%
WTVD, Durham Channel 11						
ILLR	96	96%	0	0%	4	4%
NPRM	96	96%	0	0%	4	4%
Satellite	77	77%	0	0%	23	23%
Biby	80	80%	0	0%	20	20%
WJZ, Baltimore Channel 13						
ILLR	97	91%	4	4%	5	5%
NPRM	97	91%	4	4%	5	5%
Satellite	88	83%	2	2%	16	15%
Biby	80	75%	3	3%	23	22%

Comparison of Effect of Clutter Modifications on Accuracy of ILLR Model

WPGH, Pittsburgh Channel 53

	Correct Prediction		*Over-Prediction*		*Under-Prediction*	
	(number of locations)	(percent of locations)	(number of locations)	(percent of locations)	(number of locations)	(percent of locations)
ILLR	82	79%	18	17%	4	4%
NPRM	83	80%	16	15%	5	5%
Satellite	77	74%	6	6%	21	20%
Biby	78	75%	6	6%	20	19%

ATV, Charlotte Test Channel 6

ILLR	176	88%	9	5%	14	7%
NPRM	176	88%	9	5%	14	7%
Satellite	160	80%	9	5%	30	15%
Biby	166	83%	9	5%	24	12%

ATV, Charlotte Test Channel 53

ILLR	161	81%	31	16%	7	3%
NPRM	161	81%	30	15%	8	4%
Satellite	157	79%	12	6%	30	15%
Biby	158	79%	16	8%	25	13%